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## Two *Lesquerella* (Cruciferae) of South Central and Western Montana

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**ABSTRACT.** Two heretofore unknown species of *Lesquerella* are described. These occur in limited areas in the mountains of central and western Montana. Both species, here named *L. lesicii* and *L. pulchella*, occur in patches of limestone-derived soils and rubble that are conspicuously barren of trees and shrubs and other types of plant cover, or on the borders of such areas where the limestone detritus meets soils and rubble of crystalline rocks. Also, they are often found in open areas in sparse stands of low-growing trees or shrubs.

Recent samplings of populations of *Lesquerella* in Montana show that species diversity in this genus goes somewhat beyond that previously recognized in monographic treatments (Payson, 1922; Rollins & Shaw, 1973; Rollins, 1993). What has been known for the area is that species of *Lesquerella* are often abundant and are an important component of the flora of specialized habitats, especially where limestone or derivatives of limestone are involved. The nature of some of these habitats is well shown in Figures 1 and 2, where the highly reflective limestone-derived soil and rubble contrast with the more vegetated surrounding areas. These windswept whitish areas are the places where *L. pulchella* grows. Also known is that a high degree of complexity exists within some species, such as *L. alpina* (Nuttall ex Torrey & A. Gray) S. Watson, which is frequently encountered in the general region. But now we see that there are existing taxa not previously recognized, and these have complicated relationships with species south of Montana in Idaho and Wyoming. The main purpose of this paper is to describe two new species of *Lesquerella* and explain their relationships to previously known taxa. It is somewhat ironic that I had only recently (Rollins, 1993) completed a review of *Lesquerella* as it occurs in North America when these two species showed up too late to be included in my treatment.

***Lesquerella lesicii* Rollins, sp. nov. TYPE:** U.S.A. Montana: abundant in gravelly limestone-derived soil at edge of limber pine woodland on the ridge W of Layout Creek,  $\frac{1}{2}$  mi. S of Mystery Cave, Pryor Mountains, Carbon County, 7500 ft., T85, R28 E, S21, SW  $\frac{1}{4}$ , with *Shoshonea pulvinata*, *Astragalus aretoides*, and *A. miser*, 20 June 1992, Peter Lesica 5707 and Rob DeVelica (holotype, GH).

Herba perennis, caudicibus simplicibus, folia basibus erectis dense stellatis argenteis 0.5–1 cm longis, caulibus erectis vel decumbentibus gracilibus 1–1.5 dm longis, petalis aureis spatulatis vel lingulatis 6–7 mm longis, pedicellis fructiferis recurvatis vel divaricatis 5–10 mm longis, siliquis globosis vel subglobosis 3–4 mm diametro pilis stellatis adspersis, loculis 3–5 ovulatis.

Delicate perennial; caudex simple, sometimes elongated and with old leaf bases; basal leaves erect, usually fewer than 10, entire, 1.5–3 cm long, petioles slender, abruptly expanded to blade, 1–2.5 cm long, blades broadly ovate to elliptical, 0.5–1 cm long, silvery from a dense cover of stellate trichomes; leaf trichomes small, ca. 0.02 mm diam., ray tips 15–25, each primary ray forked near its base; flowering stems very slender, mostly filiform, simple, erect to decumbent, 1–1.5 dm long; cauline leaves few, remote,  $\pm$  spatulate, lower somewhat petiolate, upper cuneate at base; inflorescences lax, rarely nodding, usually with fewer than 10 flowers; sepals erect, densely pubescent, oblong, nonsaccate and without scarious margins, 3.5–4 mm long; petals yellow, often fading to light purple toward their tips, spatulate to nearly lingulate, 6–7 mm long; stamens strongly tetradynamous; infructescences lax, greatly elongated; fruiting pedicels filiform, recurved in a single arch to widely spreading, 5–10 mm long; siliques globose or subglobose, spreading at right angles to rachis to pendent, 3–4 mm diam.,  $\pm$  densely pubescent on exterior, valves glabrous on the interior; styles ca. 1.5 mm long, glabrous or



with a few trichomes near their bases; ovules 3–5 per locule; mature seeds not seen.

*Lesquerella lesicii* is most closely related to *L. fremontii* Rollins & E. Shaw. Both species are apparently endemic to very limited areas and appear to be restricted to Madison limestone derivatives. *Lesquerella lesicii* occurs in the Pryor Mountains of Montana, which are northwest of the Big Horn Mountains and separated from that range by the canyon of the Big Horn River. *Lesquerella fremontii* is found at the southeastern end of the Wind River range in Wyoming. These areas are about 200 miles apart. The two species are singular in having small unbranched caudices (although definitely perennial), erect basal leaves, simple flowering stems, more or less recurved fruiting pedicels, and globose siliques. Both species have small, stellate, many-rayed trichomes and weak stems, which are particularly fragile in *L. lesicii*.

*Lesquerella lesicii* differs from *L. fremontii* in having basal leaves with very thin petioles that abruptly expand to a broadly ovate to orbicular blade, whereas in *L. fremontii* the petioles are stouter and expand gradually to a spatulate or nearly linear blade. The flowering stems of *L. fremontii* are horizontal along the ground and the infructescences are secund. In *L. lesicii* these stems are erect and the infructescences have the usual racemose pattern. The fruiting pedicels are definitely recurved in a single arch and the siliques are more or less pendent in *L. fremontii*, but in *L. lesicii* the pedicels, although tending to be recurved, are more often just slightly arched and are widely spreading, bearing siliques that are horizontal. The pedicels are so finely filiform that they are extremely fragile, while those of *L. fremontii* are thicker and much less fragile.

According to Peter Lesica (in litt.), *Lesquerella lesicii* is not the only endemic species that occurs in the Pryor Mountains. He points out that *Penstemon caryi* Pennell and *Erigeron allocotus* Blake are endemic there and that the recently described monotypic *Shoshonea pulvinata* Evert & Constance is restricted to Madison limestone in the Pryors, and along the front of the Beartooth, Absaroka, and Owl Creek mountains in Wyoming and Montana.

**Paratypes.** U.S.A. **Montana:** Carbon County, very common in gravelly limestone derived soil on a NE-facing slope at the head of Big Coulee, Pryor Mtns., 6400 ft., T9S, R28E, NE  $\frac{1}{4}$ , with *Cercocarpus ledifolius*, *Musineon vaginatus*, and *Agropyron spicatum*, 19 June 1992, Peter Lesica 5700 and Rob DeVelice (GH, MONTU); locally abundant in stony limestone derived soil in a wind-swept Douglas Fir forest on a ridge ca.  $\frac{1}{2}$  mi. S of Mystery Cave, Pryor Mtns., 7500 ft., T8S, R28E, Sec. 21, SW

$\frac{1}{4}$ , with *Hymenoxys torreyana* and *Eritrichium howardii*, 27 June 1991, Peter Lesica 5449 (GH, MONTU).

**Lesquerella pulchella** Rollins, sp. nov. TYPE: U.S.A. Montana: Beaverhead County, common in barren calcareous soil in open spruce woodland on S-facing slope along Trapper Creek just S of Hecha Mines, Pioneer Mtns., T3S R11W, Sec. 32, 8600 ft., with *Potentilla fruticosa* and *Zigadenus elegans*, 25 July 1991, Peter Lesica 5525 and Steve Cooper (holotype, GH; isotype, MONTU).

Herba perennis, caudicibus simplicibus, folia radicalibus simplicibus argenteis petiolata 1–2 cm longis laminis late ovatis vel ellipticis, caulis tenuibus prostratis 2–7 cm longis, folia caulina petiolata vel ad basi cuneatis, sepalis oblongis 3–4(–5) mm longis dense pubescentibus, petalis aureis spathulatis vel lingulatis (6–)7–8(–9) mm longis, pedicellis fructiferis plerumque patuleis  $\pm$  sigmoideis 5–7 mm longis, siliquis orbicularibus vel ellipticis pubescentibus (3–)4–6(–7) mm longis, 3–4 mm latis, stylis 1–1.5 mm longis, loculis 3–5 ovulatis, seminibus oblongis crassis  $\pm$  2 mm longis.

Perennial; caudex mostly simple; caudex leaves several to numerous, simple, silvery from a dense cover of appressed radiately branched trichomes, blades broadly ovate or elliptical to wider than long, obtuse, 1–2 cm long including the slender petioles; leaf trichomes in several layers, branches usually forked near their bases, primary branches 6–7; stems several to many, slender, simple or occasionally branched, mostly prostrate, 2–7 cm long; cauline leaves petiolate below to cuneate above, spatulate to narrowly elliptical or broadly ovate; inflorescences congested, flowering pedicels divaricately ascending to nearly erect, straight or nearly so; sepals narrowly oblong, 3–4(–5) mm long, nonsaccate, densely pubescent; petals yellow, spatulate to lingulate, (6–)7–8(–9) mm long; stamens erect, filaments slender, anthers oval; fruiting pedicels divaricately ascending to widely spreading, sigmoid to slightly so or nearly straight, slender, 5–7 mm long, not swollen toward the apex; siliques nearly orbicular to elliptical or broadly oblong, rounded above and below, strongly compressed contrary to the septum but with a definite ridge down the middle formed over the replum edges, densely pubescent but not silvery, (3–)4–6(–7) mm long, 3–4 mm wide; septum entire or with a narrow perforation; styles 1–1.5 mm long, not expanded at summit; seeds plump, oblong, brownish, ca. 2 mm long, wingless, cotyledons accumbent.

*Lesquerella pulchella* (Figs. 3, 4) is most closely related to *L. paysonii* Rollins. Both species have siliques compressed contrary (perpendicular) to the plane of the septum. Their foliage and siliques are





Figures 1 and 2. Typical habitats of *Lesquerella pulchella* Rollins. —1. Upper, East Pioneer range, viewed from subsummit of Black Lion Mountain. —2. Lower, north of Black Lion Mountain, south of Vipond Park. Photos by Peter Lesica.





Figures 3 and 4. *Lesquerella pulchella* Rollins (ca. natural size). — 3. Upper, flowering plant (*Lesica* 5528). — 4. Lower, fructing plants (*Lesica* 5525). Photos by Peter Lesica.

covered with relatively small, radiately branched trichomes, and in each species the foliage is silvery from the multiple layers of trichomes present. A single layer of trichomes on the silique surfaces does not produce the same silvery effect. The silique compression is more severe in *L. paysonii* than in

*L. pulchella*. The result is that the replum margin does not protrude and the replum itself is narrower in *L. paysonii* than in *L. pulchella*. In the latter, the replum margin does protrude to form a riblike ridge where the valves come together.

Generally in *Lesquerella*, the presence or absence



of trichomes on the interior of the valves is not an infallible mark of distinction between species, but most of the specimens of *Lesquerella pulchella* I have examined do have trichomes on the valve interior. On the other hand, none of the specimens of *L. paysonii* I have seen have trichomes there. This is worth noting because it may turn out to be a significant difference once enough populations have been sampled to establish the surety of the feature difference. Some variation in the length of the styles is to be expected and does occur in both species. However, this variation ranges from 2 mm in length downward in *L. pulchella*, but from 2 mm upward to 4 mm in *L. paysonii*.

There is a basic difference in the outline shape of the siliques of *Lesquerella paysonii* and *L. pulchella*. In the latter, the siliques are nearly orbicular in outline or only slightly longer than broad, while in *L. paysonii* the siliques are definitely longer than broad, usually nearly twice as long as wide. The effect of this pattern, combined with the degree of compression on the shape and length of the replum, is seen in the differences of the replum shape in the two species. The replum of *L. paysonii* is longer, narrower, and tapers more gradually toward the apex than in that of *L. pulchella*, where the replum tends toward a more oblong shape. In *L. pulchella* the valve margins are tightly pressed together so that the replum margin does not show and there is a continuous cover of trichomes over the ridge formed between the valves. But in *L. paysonii* the valve margins are rarely sufficiently together to touch each other. Here the replum margins show a break between the valves, and the trichome cover is not continuous from one valve to the other.

*Lesquerella pulchella* ranges in elevation from around 6300 to about 9600 feet. As with other plant species with such a wide elevational occurrence, there is considerable variation from population to population. Some of this variation appears to be correlated with elevation, some not. I note that the flowers on the high elevation variants are

both larger and more numerous per plant than in the populations of lower elevations. This was called to my attention by Bonnie Heidel.

*Paratypes.* U.S.A. **Montana:** Beaverhead County, common on gentle E-facing slope at the top of Keokirk Mt., near contact between crystalline and calcareous parent materials, T3S, R11W, Sec. 10, 9600 ft., 25 July 1991, *Peter Lesica 5528 and Steve Cooper* (GH, MONTU); common in portion of upper S-facing slope on ridge point, S of Bridger Pass, T7S, R11W, Sec. 27, 7140 ft., 5 Aug. 1992, *B. Heidel 938* (GH); common in barren calcareous soil on a moderate E-facing slope of the ridge N of Black Lion Mt., T2S, R11W, Sec. 29, 9200 ft., 24 July 1991, *Peter Lesica 5522 and Steve Cooper* (GH, MONTU); steep slopes of upper montane zone, Nemesis Mt., T14S, R2E, Sec. 31, 9050 ft., 27 June 1992, *B. Heidel 722* (GH); near same location, 27 June 1992, *B. Heidel 721* (GH); above Scudder Creek on ridges at the edge of Pioneer Mtns., T6S, R12W, Sec. 21, 6720 ft., 24 June 1992, *B. Heidel 700* (GH); open scree of S-facing slope, ridge E of Nemesis Mt., T14S, R2E, Sec. 21, 9000 ft., 26 July 1992, *Lisa Schassberger Roe 493 and Jonathan Stewart Roe* (GH).

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